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(54) **INCREMENTING DOSAGE MECHANISM**

INKREMENTAL-DOSIERMECHANISMUS

MECANISME DE DOSAGE INCREMENTIEL

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Description

This invention relates to an incrementing mechanism arranged to advance an elongate element through a pre-set distance on each cycle of operation of the mechanism. The invention in particular - but not exclusively - relates to such a mechanism adapted for use in conjunction with a hypodermic syringe, in order to assist the accurate dispensing of a predetermined dose of a medicament each time the syringe is used.

There have been many proposals for mechanisms intended for use with a hypodermic syringe, in order to ensure that an accurately metered dose is dispensed from the syringe. It is further known to provide a mechanism which allows the repeated dispensing of accurately metered, but perhaps individually variable, doses from a charged syringe. Such a mechanism is frequently used by persons who have to receive drugs or medicaments by injection on a frequent and on-going basis. For example, a diabetic may require a dose of insulin to be given by injection two or three times a day in order to maintain the blood-sugar level within an acceptable range, and a mechanism as has been described above conveniently is used with a hypodermic syringe to perform self-injection of the required dose of insulin.

In DE-A-3725210 there is disclosed a device for dispensing doses from a syringe, but the volume dispensed cannot be altered. Friction provided by an O-ring prevents a thrust rod from returning each time the mechanism is to be reset to dispense another dose, but when a spent cartridge of medicament is to be changed for a fresh cartridge, the thrust rod has to be pushed back against the friction provided by the O-ring. This mechanism lacks certainty in its operation, and if the O-ring is to provide sufficient friction to hold the thrust rod against movement during normal resetting, very considerable force will be needed to move the rod at the time of cartridge changing. Also, the O-ring can be expected to wear rapidly, so giving unreliable operation.

The known mechanisms intended for use with hypodermic syringes, to allow repeated dispensing of accurately-metered doses, tend to be somewhat complex and so are relatively expensive to manufacture. There is moreover a requirement to reduce the physical size of the mechanism as much as possible to make it convenient to carry and use as and when required, but this can reduce the reliability or the life of the mechanism. There is also a demand that such mechanisms should be simple and easy to use, in order to minimise the likelihood of erroneous operation.

It is a principal aim of the present invention to provide an incrementing mechanism suitable for use, for example, with a hypodermic syringe in order to assist the dispensing of accurately-metered doses of a drug or medicament from that syringe.

According to one aspect of the present invention, there is provided an incrementing mechanism to advance an elongate element in one direction relative to an outer tubular body within which the element is mounted, which mechanism comprises, in addition to said element and said body, a driving member slidably mounted on the body and arranged for relative turning movement with respect to the element, an end stop to limit sliding movement of the driving member in one direction, control means selectively to control movement of the driving member in the other direction dependent upon the required incremental movement of said element, automatic one-way clutch means disposed between the driving member and the element and arranged to permit relative sliding movement between the driving member and the element when the driving member is moved in said other direction but connecting the member to the element for simultaneous movement when the member is moved in said one direction, and means resisting movement of the element in said other direction, the one-way clutch means being disengaged upon relative turning movement of the driving member and element.

It will be appreciated that when the incrementing mechanism is used in conjunction with a hypodermic syringe, the mechanism allows the dispensing of an accurately metered dose from the syringe by controlling the advancement of the elongate element relative to the outer tubular body to which the syringe is connected, for each cycle of operation of the driving member. Initially, the driving member is moved in said other direction through a distance determined by the control means whilst the elongate element remains stationary under the action of said movement resisting means, but then on reversing the movement of the driving member and moving it forwardly until it engages the end stop, the elongate element is moved forwardly simultaneously, though the same distance. The actual dose dispensed is then a function of that distance moved by the elongate element and the area of the piston of the syringe or of a drug cartridge used in conjunction with the syringe and which piston is engaged by the forward end of the elongate element.

In a preferred embodiment, the automatic one-way clutch means comprises first and second opposed surfaces respectively on the driving member and on the element, there being a gap between the surfaces which reduces in said other direction, and a rotational clutch member, for example in the form of a ball, constrained to lie between the surfaces. The or each ball should be constrained to overlie its associated second surface of the element notwithstanding turning movement of the driving member. Advantageously, to balance the driving force coupling the driving member to the element, the automatic one-way clutch means includes at least two diametrically-opposed pairs of surfaces together with respective associated balls, though it would be possible to provide only one, or more than two pairs of such surfaces - for example, three pairs of such surfaces equally-spaced around the elongate element.

By providing between the first surfaces of the driving member a wall which is shaped to move the ball

against its spring bias, turning of the driving member relative to the element arcuately to separate said surfaces disconnects the clutch drive between the driving member and the element. Advantageously, said wall is shaped to provide in conjunction with the ball a positive click-stop position each time a first surface of the driving member overlies a second surface of the element, as the driving member is turned relative to the element.

In order to remove substantially all backlash between the driving member and the element as the member starts to move forwardly in said one direction, spring means may be arranged to drive the or each ball into its associated gap to engage both of said surfaces between which the ball lies.

In one preferred embodiment of this invention, the control means comprises thread means interconnecting the tubular body and the driving member, and a plurality of graduations on one of the driving member and tubular body and readable in conjunction with an index on the other of the driving member and the tubular body, the thread means being disengageable upon movement of the driving member at least in said one direction. The thread means may comprise internal threads within the tubular body, the driving member being a sliding fit within those threads and having at least one peg resiliently urged outwardly to engage the threads of the tubular body. Movement of the driving member in said one direction, to increment the elongate member, may then be performed by the peg riding over the threads of the tubular body. Movement of the driving member in said other direction is controlled by monitoring the graduations and index; such axial movement of the driving member may be performed by rotating the member to cause the peg to run along the internal thread of the tubular body, or by drawing the driving member in said other direction with the peg riding over the threads of the tubular member. Setting of the driving member to a position between predetermined dose settings is discouraged by virtue of the peg tending to engage in the thread form of the tubular body. Moreover, the click-stop mechanism described above assists the proper angular setting of the driving member.

In one possible arrangement, the control means comprises a sleeve threadingly engaged with the tubular body and forming an adjustable abutment to limit movement of the driving member in said other direction. There may be a plurality of graduations on one of the sleeve and the tubular body and readable in conjunction with an index on the other of the sleeve of the tubular body. In such a case, the sleeve may readily be adjustable by rotation to set a required dose.

Alternatively, the sleeve may be rotationally coupled to, but axially movable with respect to, an indicator tube which tube is also threadingly engaged with the tubular body, but by means of threads of a coarser pitch than those between the tubular body and the sleeve. By providing a plurality of graduations on one of the indicator tube and the tubular body, and readable in conjunction with an index on the other of the indicator tube and the tubular body, accurate but relatively small incremental movements of the element may be assured, with the user being able to set the position of the sleeve by monitoring the relatively large axial movement of the indicator tube.

The movement resisting means associated with the element may comprise a second automatic one-way clutch disposed between the tubular body and the element, which may be of a similar construction to said first-mentioned automatic one-way clutch, and so include spring means arranged to drive the or each clutch member into its associated gap.

The element may project from one end of the tubular body in the direction of incremental advancement of the element. That end of the body may then be adapted to be mounted on one end of a hypodermic syringe, so that the forward incremental movement of the element dispenses a measured dose from a syringe mounted on the tubular body. In this case, the mounting of the tubular body on a syringe may activate the second automatic one-way clutch, so that rearward movement of the element is thereby resisted. Conversely, removal of the syringe from the tubular member may free the second automatic one-way clutch, so permitting the element to be moved rearwardly back into the tubular body, but before this action can be completed, the first one-way clutch means must also be deactivated. In a preferred embodiment, this is achieved by turning the driving member with respect to the element so that the first and second surfaces of the clutch means no longer overlie each other. In an alternative arrangement, both the first and second one-way clutches may be simultaneously disabled by turning the elongate element with respect to the tubular body and the driving member.

By way of example only, two specific embodiments of incrementing mechanism constructed and arranged in accordance with the present invention and for use with a hypodermic syringe, will now be described in detail, reference being made to the accompanying drawings, in which:-

Figures 1 to 6 show a first embodiment of incrementing mechanism, Figure 1 being a perspective view, partially cut away, of the first embodiment; Figure 2 an axial section through the mechanism, when connected to a syringe; Figure 3 a perspective view of the front of the tubular member; Figure 4 an axial section on an enlarged scale of the front region of the thread within the tubular body; Figure 5 a partial view on the forward one-way clutch; and Figures 6A and 6B cross-sectional views on on line VI-VI marked on Figure 2, respectively for two different rotational settings;

Figure 7 is a cut-away partial section of a second embodiment of incrementing mechanism of this invention;

Figure 8 is a cross-sectional view through part of

the mechanism of Figure 7; and

Figures 9A and 9B are cross-sectional views on on line IX-IX marked on Figure 8, respectively for two different rotational settings.

Referring initially to Figures 1 to 5, it can be seen that the incrementing mechanism comprises a tubular body 10 within which is mounted a plunger 11 and a co-axial elongate syringe-operating rod 12. The forward end of the tubular body 10 is formed with a bayonet-type connector 13, to permit the connection of a syringe 14 (Figure 2) thereto. The internal surface of the tubular body 10 has a precision moulded thread 15, for a purpose to be described below.

The plunger 11 is generally tubular and has at its rear end an enlarged head 16 fitted with an end cap 17. Slidably received within the plunger 11 is the rod 12 which also has an enlarged head 18 within the plunger 11, the head 18 being engageable with an internal shoulder 19 of the plunger 11. An automatic one-way clutch mechanism 20 serves to couple the plunger 11 to the rod 12 when the plunger is driven to the left (in Figure 2) in the direction of arrow A, but allows the plunger 11 to be moved in the direction of arrow B whilst the rod 12 remains stationary.

The rod 12 has a generally H-shaped cross-section defining two channels 21, in each of which is located a respective ball 22. The plunger 11 has a pair of opposed conical surfaces 23 which may overlie the channels 21 in the rod 12, as shown in Figure 2, whereby the balls 22 may jam between those surfaces 23 and the channels 21 of the rod 12. The balls are urged to that jamming position by a washer 24 biased by spring 25 acting against sleeve 26, connected to the forward end of the plunger 11.

Referring now to Figure 3, the internal conical wall at the forward end of the plunger 11 is shown shaded, and it can be seen that there is a camming wall 27 which defines two opposed pairs of equi-spaced recesses 28, within which the conical wall forms the surfaces 23 against which the balls 22 may jam. When the plunger 11 is turned as shown by arrow C, the balls 22 will ride out of the recesses 28, over the end face 29 of the camming wall 27, and then back into the next pair of recesses 28, where jamming may take place once more. Thus, when the balls are moved against the spring bias on to end faces 29 (Figure 6B), free movement between the plunger 11 and the rod 12 is possible, though when the balls are located in the recesses 28 (Figure 6A), the plunger may be moved in the direction of arrow B whilst the rod 12 remains stationary, but on moving the plunger 11 in the direction of arrow A, the rod 12 will be moved simultaneously therewith.

By virtue of the spring bias applied to the balls 22, a click-stop will be provided for the plunger 11 with respect to the rod 12, every quarter turn.

At the forward end of sleeve 26, a further ball 30 is located in a radial bore and is urged outwardly by a bow-shaped spring 31. The ball 30 may locate in the thread 15 formed internally within the tubular body 10, so as to impart axial movement to the plunger 11 upon the rotation thereof.

A second one-way clutch mechanism is provided at the forward end of the body 10; this includes a cup member 32 which defines at the forward end of the thread 15 an annular groove 33 (Figure 4). The cup member has a lug 34 which serves to direct ball 30 out of the groove 33 and into the helical thread 15, upon rotation of the plunger 11 in the direction of arrow C (Figure 3).

The cup member 32 has a central aperture through which rod 12 passes, and serves to hold the rod against rotation with respect to body 10. The member 32 further defines a pair of ramp surfaces 35 opposed to the channels 21 in the rod 12, further balls 36 being located between those ramp surfaces 35 and the rod 12 so as to form a second one-way clutch restraining movement of the rod 12 in the direction of arrow B. The balls 36 are maintained in this position by plate 37, urged to the left (in Figures 2 and 5) by spring 38 but held in the illustrated position by the end of a syringe 14, locked to the mechanism by the bayonet connector 13. Attached to the plate 37 is a control member 39 which passes through an opening in the cup member 32 and has a control surface 40 lying closely adjacent each ball. On removing a syringe from the body 10, the plate 37 moves to the left under the action of spring 38 and the control surfaces 40 also move to the left to prevent the balls 36 locking the rod 12 against movement, in the direction of arrow B. The control member 39 also prevents the plate 37 moving too far to the left and so releasing altogether the balls 36.

As illustrated in Figure 1, the outer surface of the plunger 11 has a sequence of numerals marked thereon, visible one at a time through a transparent window 42 provided in the tubular body 10. The numerals are provided in four axial, equi-spaced columns whereby during rotation of the plunger 11, driving the plunger in the direction of arrow B as the ball 30 runs along the thread 15, each quarter-turn the next numeral appears in the window 42. Each quarter-turn position where a numeral is visible in the window 42 is defined by the click-stop of balls 22 of the one-way clutch mechanism 20 locating in a pair of recesses 28 in the internal wall 27 of the plunger 11.

In order to use the incrementing mechanism with a syringe 14 having a piston 43, to dispense a measured dose of a medicament from that syringe, the mechanism is set to an initial position before connecting the syringe by turning the plunger 11 through one eighth of a turn to lift the balls 22 clear of the recesses 28, and so release the one-way clutch mechanism 20 (Figure 6B). The rod 12 may then be pushed fully in the direction of arrow B, the balls 36 being prevented from locking rod 12 against movement in that direction by virtue of the control surfaces 40 being urged to the left by spring 38. The syringe 14 is then connected to the tubular body 10, so moving

the balls 36 to their locking position and preventing further movement of rod 12 in the direction of arrow B.

The rod may be pushed in the direction of arrow B by the piston 34 of a new syringe, as that syringe is fitted to the mechanism. In this case, the syringe should immediately by ready for use. Otherwise, the plunger 11 is then turned in the direction of arrow C until the ball 30 picks up the thread 15 and moves the plunger 11 in the direction of arrow B to the first (smallest) dose setting. The plunger 11 is pushed in the direction of arrow A until the sleeve 26 engages the cup member 32, moving the rod 12 in the direction of arrow A. This is repeated until rod 12 engages the piston 43, whereafter the mechanism is set ready for use.

From the above position, the appropriate dose is selected either by rotating the plunger 11 in the direction of arrow C until the appropriate dose shows through window 42, or by pulling the plunger 11 in the direction of arrow B and then turning the plunger 11 until the appropriate dose is visible in the window 42. Should the required dose number be over-shot, then the plunger 11 may be turned in the opposite direction, to wind the member back along the threads 15, until the appropriate numeral can be viewed; during this action, the rod 12 is not driven in the direction of arrow A, since no appreciable axial movement of the plunger 11 takes place in that direction before the balls 22 are lifted out of recesses 28 and so out of their jamming position, by internal wall 27, upon turning movement of that plunger 11. Once the dose has been set, the plunger 11 is pushed in the direction of arrow A until the forward end of the sleeve 26 engages the cup member 32, ball 30 riding over the threads 15 inside the body 10. Rod 12 is moved simultaneously with the plunger 11, to move the piston 43 in the syringe 14 and so dispense a precisely known quantity of medicament from the syringe.

The above action can be repeated until such time as the head 18 of the rod 12 engages the shoulder 19 of the plunger 11. At this point, the plunger 11 can be moved no further in the direction of arrow B and so the indicated dose is the maximum remaining amount of medicament which can be dispensed from the syringe. Once this has been discharged, the syringe (or cartridge within the syringe) must be replaced by a fresh one, following the above-described sequence of events.

Figures 7 to 9 show a second embodiment of incrementing mechanism of this invention, and like parts with those of the first embodiment described above are given like reference characters; those parts will not be described in detail again here. This embodiment has been arranged to allow the accurate dispensing of relatively small doses. To permit this, two threads are formed internally in the body 10, a first thread 60 of a relatively fine pitch and a second thread 61 of a relatively coarse pitch. An externally-threaded dose control sleeve 62 is engaged with the first threads 60 and an indicator tube 63 having external threads 64 at its rear end is engaged with the second threads 61. A plunger 65 is formed with external splines 66, the sleeve 62 and tube 63 being slidably mounted on the plunger 65 by means of corresponding internal splines which prevent relative rotation therebetween. Rotation of the sleeve 62 and tube 63 is performed by turning a cap 67 rotatably mounted on the rear end of the body 10 and locked to the plunger by means of a plug 68 having legs 69 received in the splines on the plunger and in corresponding internal splines in the cap. This plug 68 could be replaced by a plug having no such legs whereby the cap may rotate freely on the body, but when the plunger is to be turned to set a different dose, a locking member may be inserted through an opening in that plug.

The rear end of the syringe operating rod 12 is provided with springy arms 70 the outer ends of which are engaged in grooves 71 formed internally in the plunger. These serve to give a 'click-stop' feel to rotation of the plunger through successive doses, and to prevent the plunger turning other than when expressly driven by cap 67.

A one-way clutch 20 is formed between rod 12 and a sleeve 72 rotatably connected to the forward end of the plunger but held against rotation with respect to the body 10; the sleeve 72 provides an internal conical surface 23 co-acting with balls 22 and has a camming wall similar to that wall 27 of the previous embodiment. Here, the balls 22 are urged rearwardly by a spring-loaded blocking member 73, rather than washer 24 (Figure 2).

At the forward end of the body 10, there is formed a second one-way clutch to prevent rearward movement of rod 12 during rearward movement of the plunger 65. This clutch is similar to that described with reference to Figures 1 and 2, but is held inactive by a different mechanism, during medicament cartridge changing. A bushing 74 is mounted in the forward end of the body 10 and has bayonet slots 75 to receive dogs 76 formed externally on a cartridge holder 77, part of a cartridge being shown at 78. The rear of the cartridge holder 77 is engageable with a cap member 79 rotatably mounted within the bushing 74, so that member 79 is turned with the holder 77, during making or breaking of the bayonet connection. Cup member 79 has a pair of internal projections 80 engaged in grooves 81 formed in rod 12, so that the rod 12 will also be turned with the member 79. The member 79 further has spring fingers 82 arranged to urge balls 36 rearwardly, against a generally-conical surface formed in an internal part of bushing 74. As shown in Figures 9A and 9B, this conical surface is profiled to have cut-away regions 83, whereby locking is possible only when rod 12 is correctly aligned in the rotational sense with sleeve 72, as shown in Figure 9A.

Sleeve 72 has an external rib 84 which is engageable with a groove in a forward extension 85 of the dose control sleeve 62, when the mechanism is in the initial (no dose set) position, but also when a dose has been set and the plunger 65 is then pulled fully to the right. This gives a tactile feed-back to the operator, to indicate the plunger has been pulled to the required extent. The

sleeve 72 also has a plurality of forward-projecting fingers 86 each having an external rib 87, engageable with a shoulder 88 in bushing 74, when the plunger has been pushed fully to the left. In this position, the fingers project through apertures formed in the bushing 74, around the conical surface which co-acts with balls 36. Also, there is a splined connection between sleeve 72 and bushing 74, to prevent relative rotation therebetween.

This second embodiment operates in a generally similar manner to that described above with reference to Figures 1 to 5. A required dose is set by turning cap 67 until the appropriate numeral is visible through window 42, whereafter the plunger 65 is pulled to the right (in Figure 7) to the limit defined by the position of dose control sleeve 62, and is then pushed to the left, to dispense the dose. The tube 63 moves axially through a relatively large extent for a given angular movement of the cap 67, so assisting the easy selection of the appropriate dose, but the sleeve 62 moves through a relatively small extent, though is accurately set axially on account of the fine threads, to allow the dispensing of a precise dose.

When a cartridge of medicament is spent, the holder 77 is released from body 10 to permit replacement of the cartridge. This action turns the rod 12 via projections 80 of the cap member 79, so moving the rod with respect to bushing 74 from the setting of Figure 9A to that of Figure 9B. This releases both ball clutches, so permitting the rod 12 to be moved to the right (in Figures 7 and 8) and allowing the installation of a fresh cartridge. The mechanism is then re-set as described above, ready for dispensing further doses.

Claims

1. An incrementing mechanism to advance an elongate element (12) in one direction relative to an outer tubular body (10) within which the element is mounted, which mechanism comprises, in addition to said element (12) and said body (10), a driving member (11,26) slidably mounted on the body (10), an end stop (32) to limit sliding movement of the driving member (11,26) in one direction (A), control means (15,30) selectively to control movement of the driving member in the other direction (B) dependent upon the required incremental movement of said element, automatic one-way clutch means (20) disposed between the driving member (11) and the element (12) and arranged to permit relative sliding movement between the driving member and the element when the driving member is moved in said other direction (B) but connecting the member to the element for simultaneous movement when the member is moved in said one direction (A), and means (35,36) resisting movement of the element in said other direction, characterised in that the driving member (11,26) is arranged for relative turning movement with respect to the element (12), and in that the one-way clutch means (20) is disengaged upon relative turning movement of the driving member (11,26) and element (12).

2. An incrementing mechanism according to Claim 1, wherein the automatic one-way clutch means (20) comprises first and second opposed surfaces (23,21) respectively on the driving member and on the element, there being a gap between the surfaces which reduces in said other direction, and a rotational clutch member (22) constrained to lie between the surfaces.

3. An incrementing mechanism according to Claim 2, wherein the rotational clutch member comprises a ball (22).

4. An incrementing mechanism according to Claim 3, wherein said clutch means (20) includes at least two channel-shaped diametrically-opposed surfaces (21) on the driving member together with respective associated balls (22).

5. An incrementing mechanism according to Claim 3 or Claim 4, wherein spring means (25) is arranged to drive the or each ball (22) into its associated gap to inter-engage said surfaces between which the ball lies.

6. An incrementing mechanism according to Claim 4 and Claim 5, wherein the or each ball (22) is constrained to overlie its associated second surface (21) of the element (12), and between the first surfaces of the driving member there is defined a wall (28) which is shaped to move the ball against its spring bias to disconnect the clutch drive between the driving member and the element upon turning the driving member relative to the element.

7. An incrementing mechanism according to any of the preceding Claims, wherein the control means comprises a thread means (15,30) interconnecting the tubular body (10) and the driving member (11), and a plurality of graduations (41) on one of the driving member and tubular body and readable in conjunction with an index (42) on the other of the driving member and the tubular body, the thread means being disengageable upon movement of the driving member at least in said one direction.

8. An incrementing mechanism according to Claim 7, wherein the tubular body (10) is internally threaded, the driving member (11) is a sliding fit within the threads of the tubular body, and the driving member has at least one peg (30) resiliently urged outwardly (31) to engage the threads of the tubular body.

9. An incrementing mechanism according to Claim 7 or Claim 8, wherein said graduations are marked on the external surface of the driving member and are visible one at a time through a window formed in the tubular body.

10. An incrementing mechanism according to any of Claims 1 to 7, wherein the control means comprises a sleeve (62) threadingly engaged with the tubular body and forming an adjustable abutment to limit movement of the driving member in said other direction.

11. An incrementing mechanism according to Claim 10, wherein there is a plurality of graduations on one of the sleeve and tubular body and readable in conjunction with an index (42) on the other of the sleeve and the tubular body.

12. An incrementing mechanism according to Claim 10, wherein the sleeve (62) is rotationally coupled to, but axially slidable with respect to, an indicator tube (63), which tube is also threadingly engaged with the tubular body but with threads (64) of a different pitch to those (60) between the tubular body and the sleeve, and there is a plurality of graduations on one of the indicator tube and tubular body and readable in conjunction with an index (42) on the other of the indicator tube and the tubular body.

13. An incrementing mechanism according to any of the preceding Claims, wherein said movement resisting means comprises a second automatic one-way clutch (35,36) disposed between the tubular body and the element.

14. An incrementing mechanism according to Claim 13, wherein the second one-way clutch comprises first and second opposed surfaces (35,21) respectively on the tubular body and on the element, there being a gap between the surfaces which reduces in said other direction, and a rotational clutch member (36) constrained to lie between the surfaces.

15. An incrementing mechanism according to Claim 14, wherein spring means (38) is arranged to drive the or each clutch member into its associated gap to engage both of said surfaces between which the clutch member lies.

16. An incrementing mechanism according to any of the preceding Claims, wherein the element (12) projects from one end of the tubular body in the direction of incremental advancement of the element, and that end of the body is adapted (13) to be mounted on one end of a hypodermic syringe so that the forward incremental movement of the element may dispense a measured dose from a mounted syringe.

17. An incrementing mechanism according to Claim 15 and Claim 16, wherein the mounting of the tubular body on a syringe charges (37,38) the spring means for the second automatic one-way clutch.

18. The combination of an incrementing mechanism according to any of Claims 1 to 15, and a hypodermic syringe including a piston slidable within a cylinder to dispense liquid charged in the cylinder, the piston being coupled to the elongate rod to move with the rod as the driving member is moved in said one direction, towards the piston, thereby to dispense liquid.

Patentansprüche

1. Inkrementier-Mechanismus zum Vorschieben eines länglichen Elements (12) in eine Richtung relativ zu einem äußeren rohrförmigen Körper (10), in dem das Element montiert ist, wobei der Mechanismus zusätzlich zu dem Element (12) und dem Körper (10) aufweist: ein Antriebsbauteil (11, 26), das verschiebbar an dem Körper (10) montiert ist, einen Endanschlag (32) zur Begrenzung der Verschiebebewegung des Antriebsbauteils (11, 26) in eine Richtung (A), eine Steuereinrichtung (15, 30), um wahlweise die Bewegung des Antriebsbauteils in die andere Richtung (B) zu steuern, und zwar abhängig von der erforderlichen Inkrementalbewegung des Elements, eine automatische Einrichtungs-Kupplungseinrichtung (20), die zwischen dem Antriebsbauteil (11) und dem Element (12) vorgesehen und dazu ausgestaltet ist, um eine relative Verschiebebewegung zwischen dem Antriebsbauteil und dem Element zu ermöglichen, wenn das Antriebsbauteil in die andere Richtung (B) bewegt wird, um aber das Bauteil mit dem Element für eine simultane Bewegung zu koppeln, wenn das Bauteil in die eine Richtung (A) bewegt wird, und Einrichtungen (35, 36), die einer Bewegung des Elements in die andere Richtung entgegenwirken, dadurch gekennzeichnet, daß das Antriebsbauteil (11, 26) für eine relative Drehbewegung bezüglich des Elements (12) ausgestaltet ist und daß die Einrichtungs-Kupplungseinrichtung (20) bei einer relativer Drehbewegung zwischen dem Antriebsbauteil (11, 26) und dem Element (12) außer Eingriff gerät.

2. Inkrementier-Mechanismus nach Anspruch 1, bei dem die automatische Einrichtungs-Kupplungseinrichtung (20) erste und zweite gegenüberliegende Flächen (23, 21) an dem Antriebsbauteil bzw. an dem Element aufweist, wobei zwischen den Flächen ein Spalt vorgesehen ist, der zur anderen Richtung hin enger wird, und wobei ein drehbares

Kupplungsbauteil (22) zwischen den Flächen liegend eingeklemmt ist.

3. Inkrementier-Mechanismus nach Anspruch 2, bei dem das drehbare Kupplungsbauteil eine Kugel (22) enthält.

4. Inkrementier-Mechanismus nach Anspruch 3, bei dem die Kupplungseinrichtung (20) zumindest zwei kanalförmige, diametral gegenüberliegende Flächen (21) am Antriebsbauteil zusammen mit jeweils zugehörigen Kugeln (22) enthält.

5. Inkrementier-Mechanismus nach Anspruch 3 oder Anspruch 4, bei dem eine Federeinrichtung (25) angeordnet ist, um die oder jede Kugel (22) in ihren zugehörigen Spalt zu drücken, um die Flächen, zwischen denen die Kugel liegt, miteinander zu koppeln.

6. Inkrementier-Mechanismus nach Anspruch 4 oder Anspruch 5, bei dem die oder jede Kugel (22) eingeklemmt ist, um a.uf ihrer zugehörigen zweiten Fläche (21) des Elements (12) zu liegen, und wobei zwischen den ersten Flächen des Antriebsbauteils eine Wand (28) ausgebildet ist, die geformt ist, um die Kugel gegen deren Federkraft zu bewegen, um den Kupplungseingriff zwischen dem Antriebsbauteil und dem Element bei Drehung des Antriebsbauteils relativ zu dem Element zu lösen.

7. Inkrementier-Mechanismus nach einem der vorhergehenden Ansprüche, bei dem die Steuereinrichtung eine Gewindeeinrichtung (15, 30) enthält, durch die der rohrförmige Körper (10) und das Antriebsbauteil (11) miteinander verbunden sind, und wobei eine Anzahl von Einteilungen (41) entweder auf dem Antriebsbauteil oder auf dem rohrförmigen Körper vorgesehen ist, die in Verbindung mit einem Index (42) an dem jeweils anderen von dem rohrförmigen Körper oder dem Antriebsbauteil lesbar sind, wobei die Gewindeeinrichtung bei Bewegung des Antriebsbauteils in zumindest die eine Richtung außer Eingriff gebracht werden kann.

8. Inkrementier-Mechanismus nach Anspruch 7, bei dem der rohrförmige Körper (10) ein Innengewinde hat, das Antriebsbauteil (11) in Form einer Gleitpassung in den Gewindegängen des rohrförmigen Körpers sitzt und das Antriebsbauteil zumindest einen Zapfen (30) aufweist, der federnd nach außen (31) gedrückt wird, um mit den Gewindegängen des rohrförmigen Körpers einzugreifen.

9. Inkrementier-Mechanismus nach Anspruch 7 oder Anspruch 8, bei dem die Einteilungen auf der Außenfläche des Antriebsbauteils vorgesehen sind und jeweils eine zur Zeit durch ein Fenster zu sehen sind, das in dem rohrförmigen Körper ausgebildet ist.

10. Inkrementier-Mechanismus nach einem der Ansprüche 1 bis 7, bei dem die Steuereinrichtung eine Muffe (62) aufweist, die schraubbar mit dem rohrförmigen Körper in Eingriff steht und einen verstellbaren Anschlag bildet, um die Bewegung des Antriebsbauteils in die andere Richtung zu begrenzen.

11. Inkrementier-Mechanismus nach Anspruch 10, bei dem eine Anzahl von Einteilungen entweder an der Muffe oder an dem rohrförmigen Körper vorgesehen ist, die zusammen mit einem Index (42) an dem jeweils anderen von der Muffe oder dem rohrförmigen Körper lesbar sind.

12. Inkrementier-Mechanismus nach Anspruch 10, bei dem die Muffe (62) drehbar mit einem Anzeigerohr (63) gekoppelt, jedoch relativ zu diesem axial verschiebbar ist, wobei das Rohr ebenfalls verschraubbar mit dem rohrförmigen Körper in Eingriff steht, jedoch durch Gewindegänge (64) mit einer Gewindesteigung, die von der (60) zwischen dem rohrförmigen Körper und der Muffe verschieden ist, und wobei eine Anzahl von Einteilungen entweder an dem Anzeigerohr oder dem rohrförmigen Körper vorgesehen ist, die zusammen mit einem Index (42) an dem jeweils anderen von dem Anzeigerohr oder dem rohrförmigen Körper lesbar sind.

13. Inkrementier-Mechanismus nach einem der vorhergehenden Ansprüche, bei dem die einer Bewegung entgegenwirkenden Einrichtung eine zweite automatische Einrichtungs-Kupplungseinrichtung (35, 36) aufweist, die zwischen dem rohrförmigen Körper und dem Element vorgesehen ist.

14. Inkrementier-Mechanismus nach Anspruch 13, bei dem die zweite Einrichtungs-Kupplungseinrichtung erste und zweite gegenüberliegende Flächen (35, 21) an dem rohrförmigen Körper bzw. an dem Element aufweist, wobei zwischen den Flächen ein Spalt vorgesehen ist, der zur anderen Richtung hin enger wird, und wobei ein drehbares Kupplungsbauteil (36) zwischen den Flächen liegend eingeklemmt ist.

15. Inkrementier-Mechanismus nach Anspruch 14, bei dem eine Federeinrichtung (38) dazu ausgestaltet ist, das oder jedes Kupplungsbauteil in seinen zugehörigen Spalt zu drücken, um die beiden Flächen, zwischen denen das Kupplungsbauteil liegt, miteinander zu koppeln.

16. Inkrementier-Mechanismus nach einem der vorhergehenden Ansprüche, bei dem das Element (12) von einem Ende des rohrförmigen Körpers in die

Richtung des inkrementalen Vorschubs des Elementes vorsteht, und wobei dieses Ende (13) des Körpers dazu ausgestaltet ist, an einem Ende einer Subkutanspritze angebracht zu werden, so daß durch die nach vorne gerichtete inkrementale Bewegung des Elements eine gemessene Dosis aus einer angebrachten Spritze ausgegeben wird.

17. Inkrementier-Mechanismus nach Anspruch 15 und Anspruch 16, bei dem durch Anbringen des rohrförmigen Körpers an einer Spritze die Federeinrichtung (37, 38) für die zweite automatische Einrichtungs-Kupplungseinrichtung gespannt wird.

18. Kombination eines Inkrementier-Mechanismus nach einem der Ansprüche 1 bis 15 und einer Subkutanspritze mit einem Kolben, der in einem Zylinder verschiebbar ist, um eine in dem Zylinder enthaltende Flüssigkeit auszugeben, wobei der Kolben mit dem länglichen Element gekoppelt ist, um sich zusammen mit dem Element zu bewegen, wenn das Antriebsbauteil in die eine Richtung zum Kolben hin bewegt wird, um dadurch die Flüssigkeit auszugeben.

Revendications

1. Mécanisme incrémentiel pour faire avancer un élément allongé (12) dans une première direction par rapport à un corps tubulaire extérieur (10) dans lequel l'élément est monté, ce mécanisme comprenant, outre ledit élément (12) et ledit corps (10), un organe d'entraînement (11, 26) monté coulissant sur le corps (10), une butée d'extrémité (32) pour limiter le mouvement coulissant de l'organe d'entraînement (11, 26) dans une première direction (A), des moyens de commande (15, 30) pour commander sélectivement le mouvement de l'organe d'entraînement dans l'autre direction (B) en fonction du mouvement incrémentiel requis dudit élément, des moyens d'accouplement unidirectionnel automatique (20) disposés entre l'organe d'entraînement (11) et l'élément (12) et agencés pour permettre un mouvement coulissant relatif entre l'organe d'entraînement et l'élément lorsque l'organe d'entraînement est déplacé dans ladite autre direction (B) mais reliant l'organe à l'élément pour un mouvement simultané lorsque l'organe est déplacé dans ladite première direction (A), et des moyens (35, 36) résistant au mouvement de l'élément dans ladite autre direction, caractérisé en ce que l'organe d'entraînement (11, 26) est agencé pour un mouvement tournant par rapport à l'élément (12), et en ce que le moyen d'accouplement unidirectionnel (20) est désaccouplé en cas de mouvement relatif de rotation entre l'organe d'entraînement (11, 26) et l'élément (12).

2. Mécanisme incrémentiel selon la revendication 1, dans lequel le moyen d'accouplement unidirectionnel automatique (20) comprend des première et seconde surfaces opposées (23, 21) respectivement sur l'organe d'entraînement et sur l'élément, les surfaces ayant entre elles un intervalle se réduisant dans ladite autre direction, et un organe d'accouplement rotatif (22) contraint de demeurer entre les surfaces.

3. Mécanisme incrémentiel selon la revendication 2, dans lequel l'organe d'accouplement rotatif comprend une bille (22).

4. Mécanisme incrémentiel selon la revendication 3, dans lequel ledit moyen d'accouplement (20) inclut au moins deux surfaces en forme de rainure, diamétralement opposées (21) sur l'organe d'entraînement ainsi que des billes respectives associées (22).

5. Mécanisme incrémentiel selon la revendication 3 ou 4, dans lequel un moyen à ressort (25) est agencé pour entraîner la bille (22) ou chaque bille dans son intervalle associé pour inter-engager lesdites surfaces entre lesquelles se trouve la bille.

6. Mécanisme incrémentiel selon la revendication 4 ou 5, dans lequel la bille ou chaque bille (22) est contrainte de rester sur sa seconde surface associée (21) de l'élément (12), et entre les premières surfaces de l'organe d'entraînement est définie une paroi (28) qui est conformée pour déplacer la bille à l'encontre de son rappel élastique pour désaccoupler l'accouplement entre l'organe d'entraînement et l'élément, en cas de rotation de l'organe d'entraînement par rapport à l'élément.

7. Mécanisme incrémentiel selon l'une quelconque des revendications précédentes, dans lequel les moyens de commande comprennent un moyen fileté (15, 30) reliant l'un à l'autre le corps tubulaire (10) et l'organe d'entraînement (11), et une série de graduations (41) sur l'un des organes d'entraînement et du corps tubulaire et lisibles conjointement avec un index (42) sur l'autre de l'organe d'entraînement et du corps tubulaire, les moyens filetés étant dégageables en cas de mouvement de l'organe d'entraînement au moins dans ladite première direction.

8. Mécanisme incrémentiel selon la revendication 7, dans lequel le corps tubulaire (10) est fileté intérieurement, l'organe d'entraînement (11) est un montage coulissant dans les filets du corps tubulaire, et l'organe d'entraînement possède au moins un ergot (30) sollicité élastiquement vers l'extérieur (31) pour s'engager dans les filets de l'organe tubulaire.

9. Mécanisme incrémentiel selon la revendication 7 ou 8, dans lequel les graduations sont marquées sur la surface extérieure de l'organe d'entraînement et sont visibles une à la fois à travers une fenêtre formée dans le corps tubulaire.

10. Mécanisme incrémentiel selon l'une quelconque des revendications 1 à 7, dans lequel les moyens de commande comprennent un manchon (62) en prise de filetage avec le corps tubulaire et formant une butée réglable pour limiter le mouvement de l'organe d'entraînement dans ladite autre direction.

11. Mécanisme incrémentiel selon la revendication 10, dans lequel il y a sur l'un du manchon et du corps tubulaire une série de graduations visibles conjointement avec un index (42) sur l'autre du manchon et du corps tubulaire.

12. Mécanisme incrémentiel selon la revendication 10, dans lequel le manchon (62) est couplé en rotation mais axialement coulissant à l'égard d'un tube indicateur (63) qui est également en prise de filetage avec le corps tubulaire mais avec des filets (64) d'un pas différent de ceux (60) entre le corps tubulaire et le manchon, et il y a sur l'un du tube indicateur et du corps tubulaire une série de graduations lisibles conjointement avec un index (42) sur l'autre du tube indicateur et du corps tubulaire.

13. Mécanisme incrémentiel selon l'une des revendications précédentes, dans lequel lesdits moyens résistant au mouvement comprennent un second accouplement unidirectionnel automatique (35, 36) disposé entre le corps tubulaire et l'élément.

14. Mécanisme incrémentiel selon la revendication 13, dans lequel le second accouplement unidirectionnel comprend des première et seconde surfaces opposées (35, 21) respectivement sur le corps tubulaire et sur l'élément, les surfaces ayant entre elles un intervalle se réduisant dans ladite autre direction, et un organe d'accouplement rotatif (36) contraint de demeurer entre les surfaces.

15. Mécanisme incrémentiel selon la revendication 14, dans lequel un moyen à ressort (38) est agencé pour entraîner l'organe d'accouplement ou chaque organe d'accouplement dans son intervalle associé pour inter-engager lesdites deux surfaces entre lesquelles se trouve l'organe d'accouplement.

16. Mécanisme incrémentiel selon l'une quelconque des revendications précédentes, dans lequel l'élément (12) fait saillie d'une première extrémité du corps tubulaire dans la direction de l'avance incrémentielle de l'élément, et cette extrémité du corps est adaptée (13) à être montée sur une première extrémité d'une seringue hypodermique de façon que le mouvement incrémentiel de l'élément vers l'avant puisse dispenser une dose mesurée à partir d'une seringue montée.

17. Mécanisme incrémentiel selon la revendication 15 ou 16, dans lequel le montage du corps tubulaire sur une seringue charge (37, 38) les moyens élastiques pour le second accouplement unidirectionnel automatique.

18. Combinaison d'un mécanisme incrémentiel selon l'une quelconque des revendications 1 à 15, et d'une seringue hypodermique incluant un piston coulissant dans un cylindre pour dispenser un liquide chargé dans le cylindre, le piston étant couplé à la tige allongée pour se déplacer avec la tige lorsque l'organe d'entraînement est déplacé dans ladite première direction, vers le piston, de façon à dispenser du liquide.

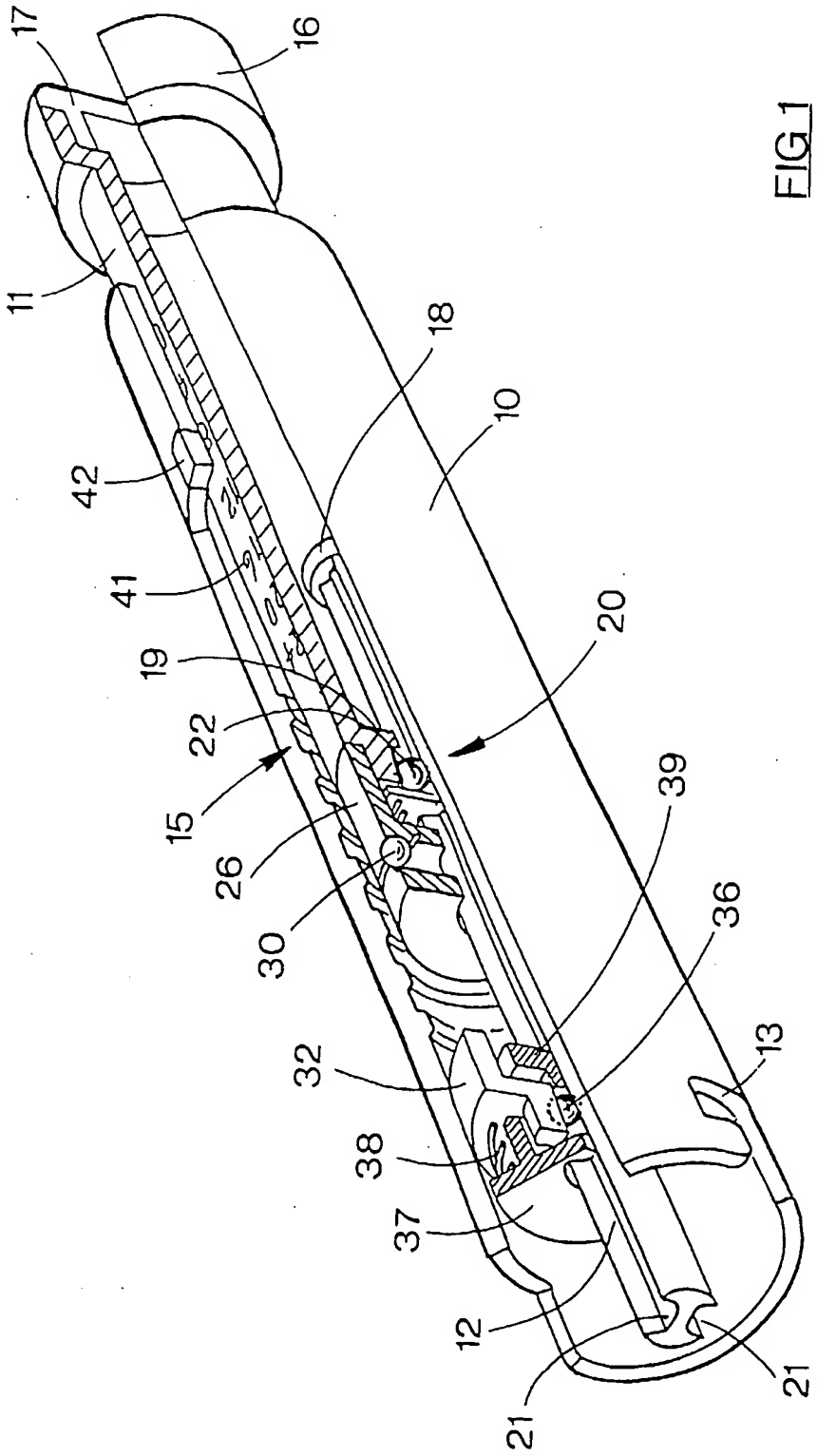

FIG 1

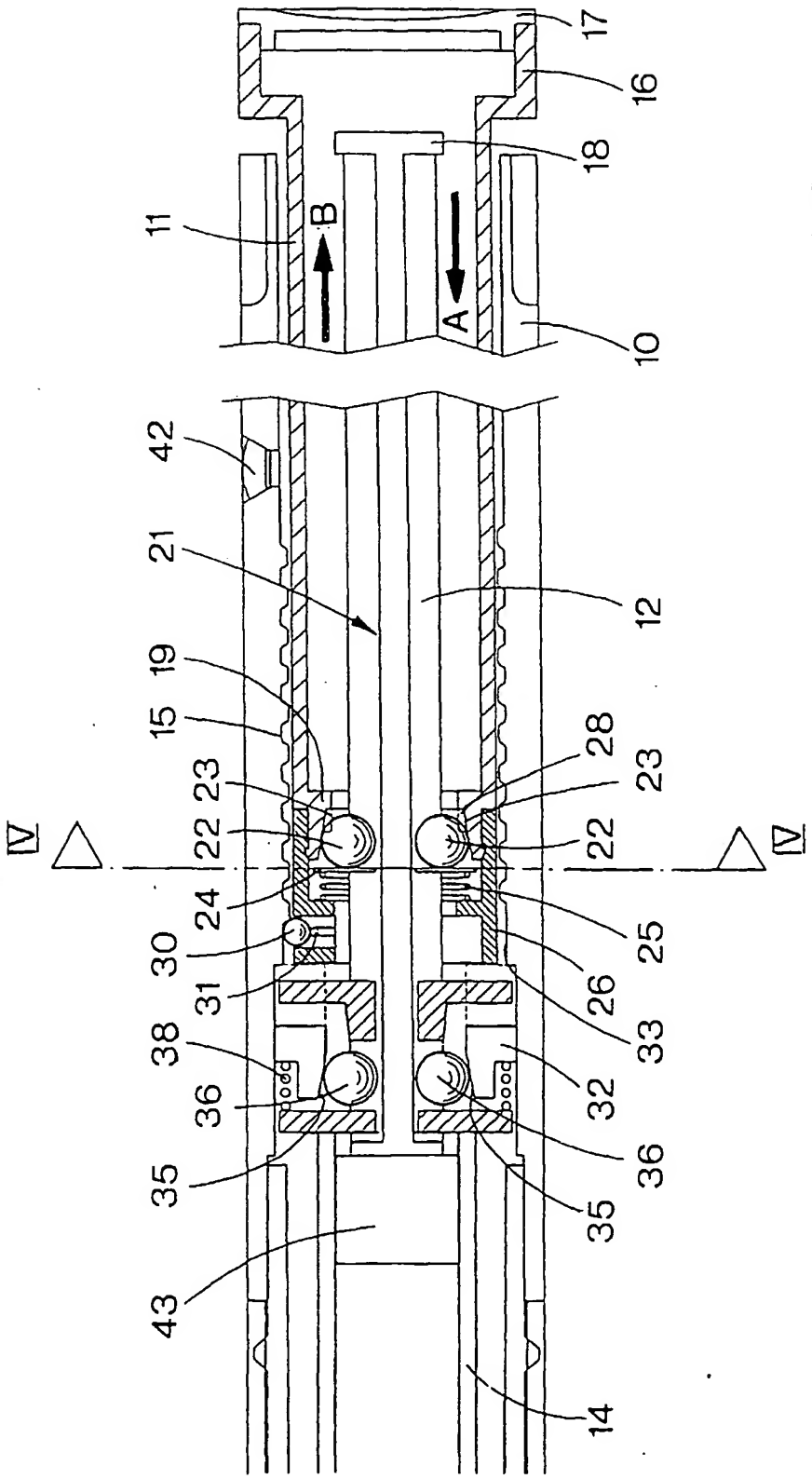
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FIG 2

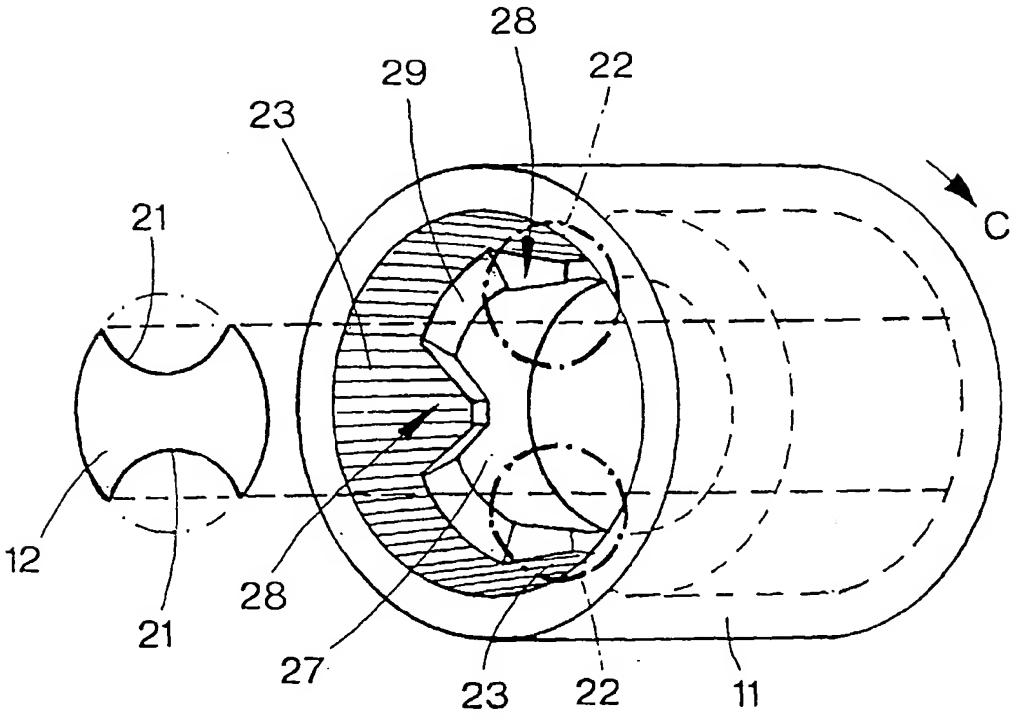

FIG 3

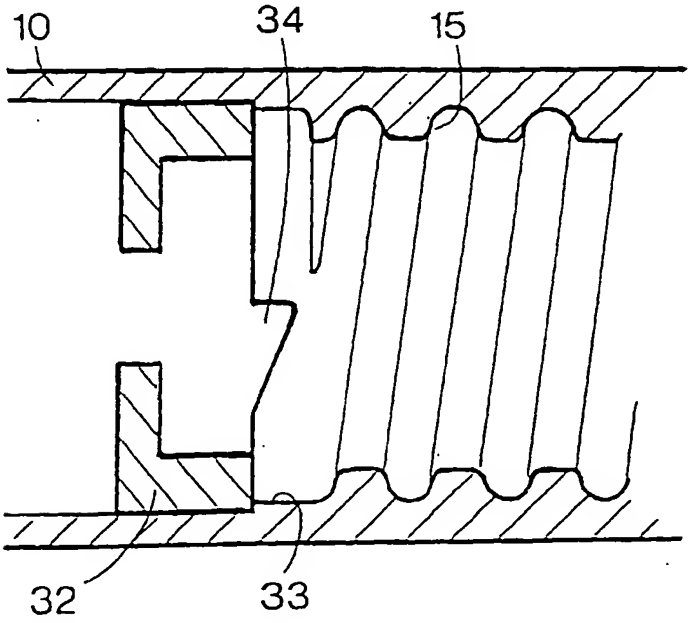

FIG 4

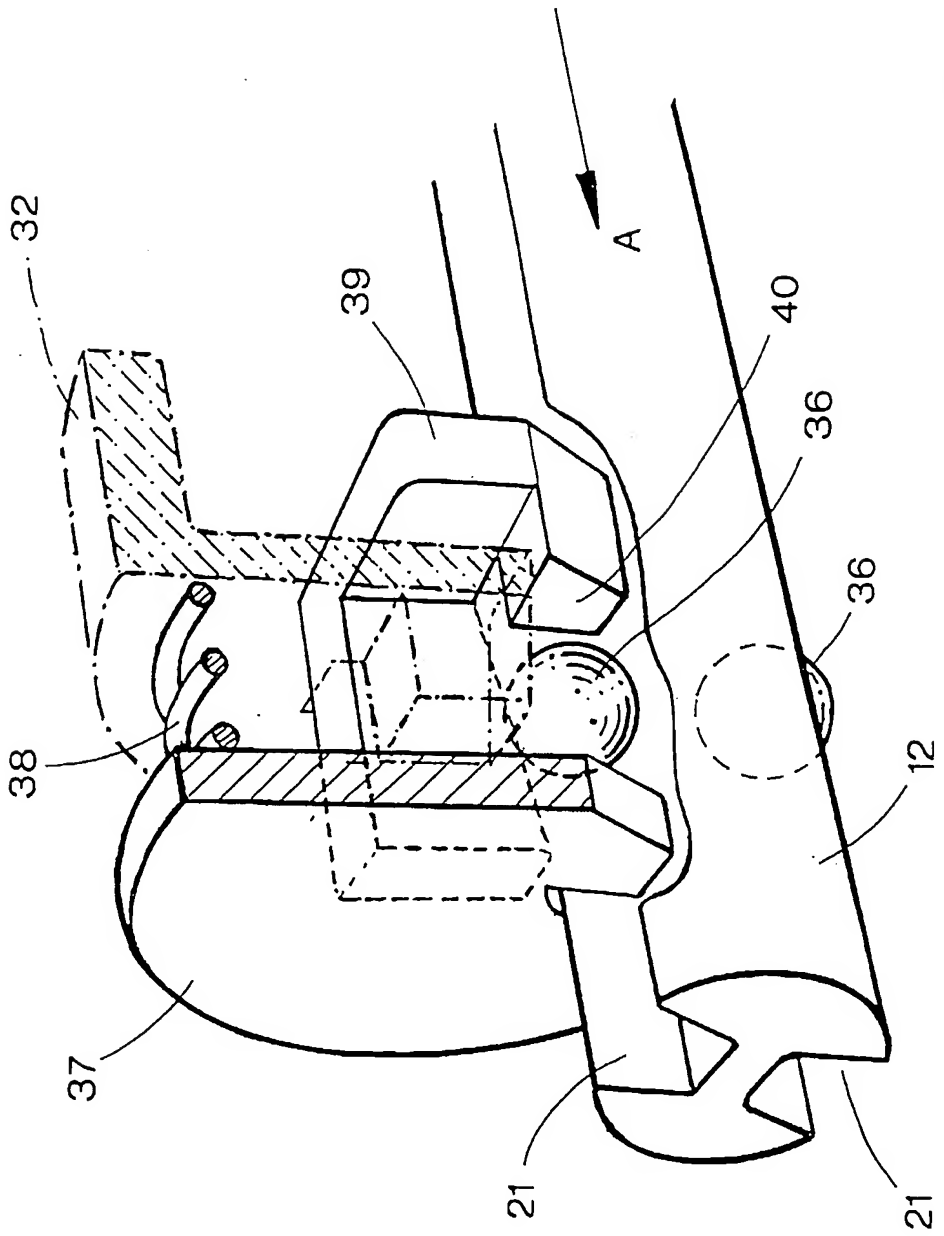

FIG 5

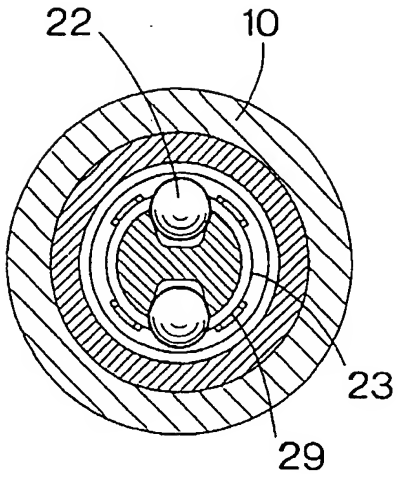

FIG 6A

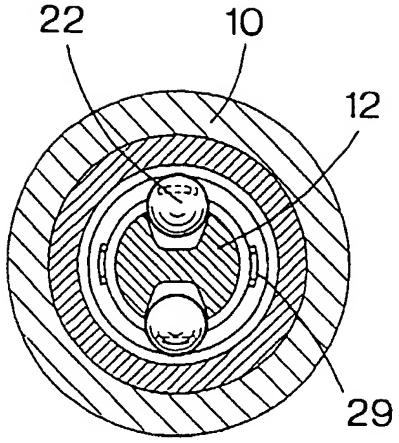

FIG 6B

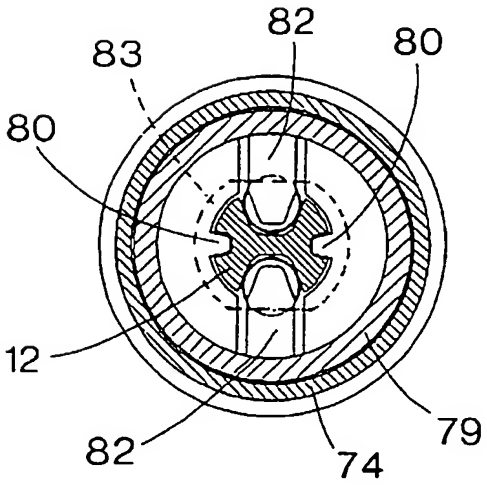

FIG 9A

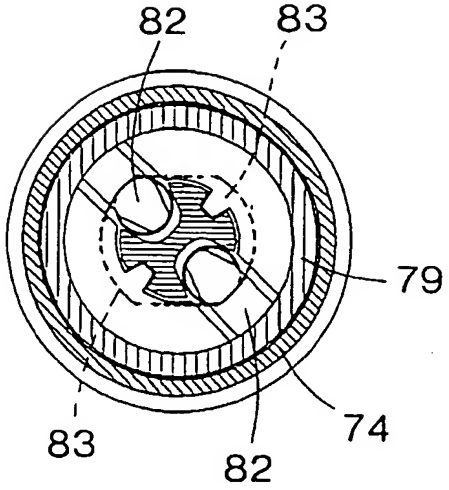

FIG 9B

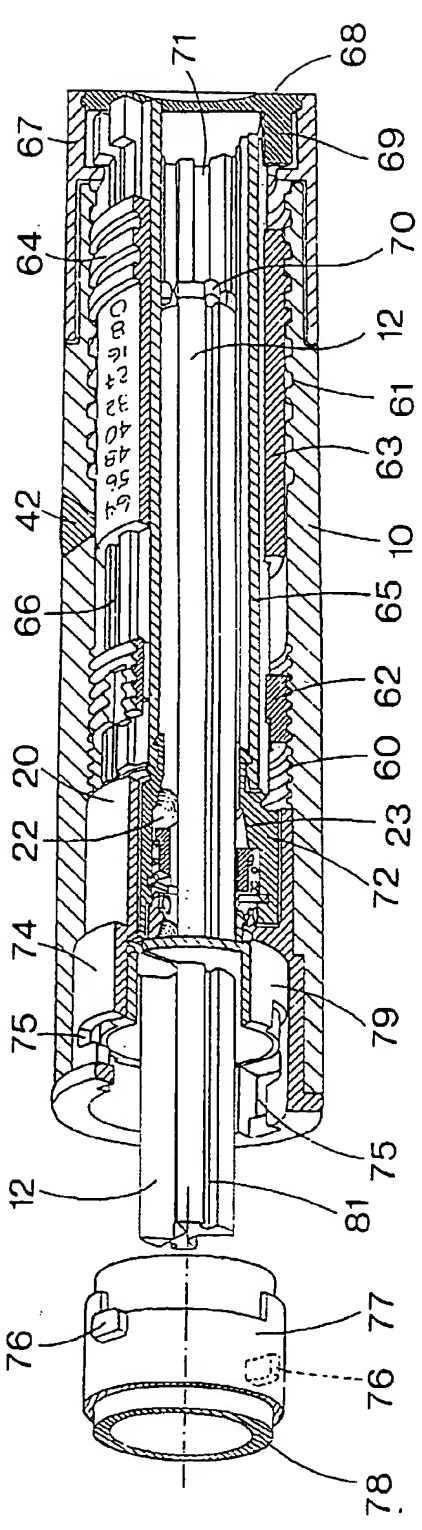
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FIG 7

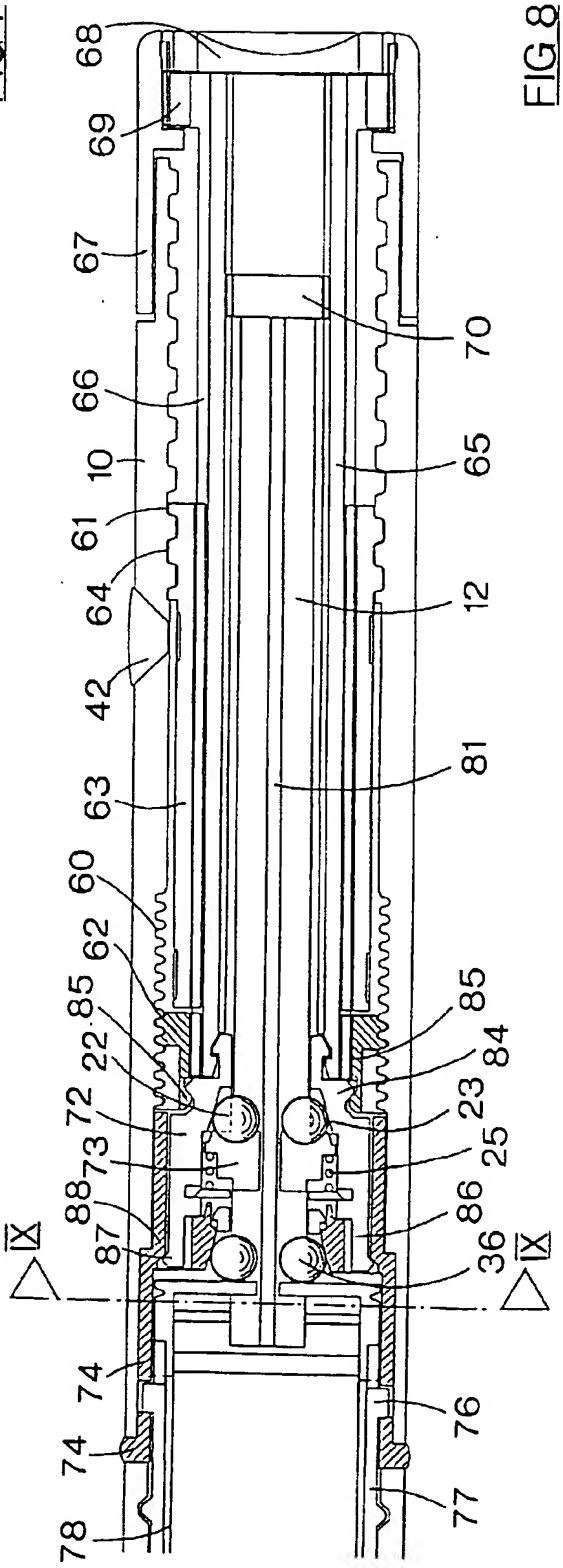
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FIG 8